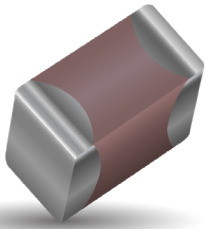


# X5R Dielectric, KGM Series

## General Specifications



### GENERAL DESCRIPTION

- General Purpose Dielectric for Ceramic Capacitors
- EIA Class II Dielectric
- Temperature variation of capacitance is within  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Well suited for decoupling and filtering applications
- Available in High Capacitance values (up to  $100\mu\text{F}$ )

### HOW TO ORDER

| KGM                                  | 03  | A                | R5                | 1E   | 101  | M   | N                |
|--------------------------------------|---|------------------|-------------------|--|--|---|------------------|
| <b>Series</b>                        | <b>Size</b>   | <b>Thickness</b> | <b>Dielectric</b> | <b>Voltage</b>   | <b>Capacitance Code Code (in pF)</b>   | <b>Capacitance Tolerance</b>              | <b>Packaging</b> |
| General Purpose<br>Tin/Nickel Finish | 02 = 01005<br>03 = 0201<br>05 = 0402<br>15 = 0603<br>21 = 0805<br>31 = 1206<br>32 = 1210<br>43 = 1812 | See Cap Chart    | R5 = X5R          | 0G = 4.0V<br>0J = 6.3V<br>1A = 10V<br>1C = 16V<br>1V = 35V<br>1E = 25V<br>1H = 50V | Two Significant Digits +<br>Number of zeroes<br>eg. 106 = 10 $\mu\text{F}$<br>103 = 10nF<br>470 = 47pF | J* = +/- 5%<br>K = +/- 10%<br>M = +/- 20% | See Table Below  |

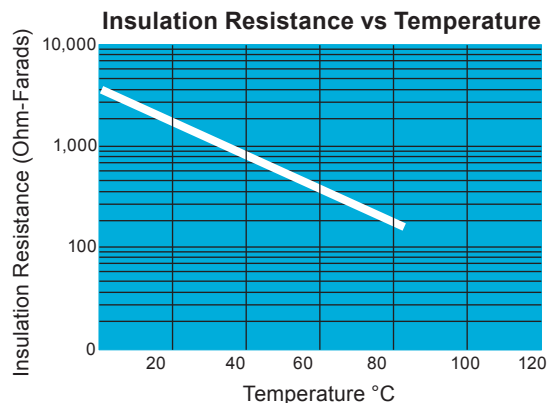
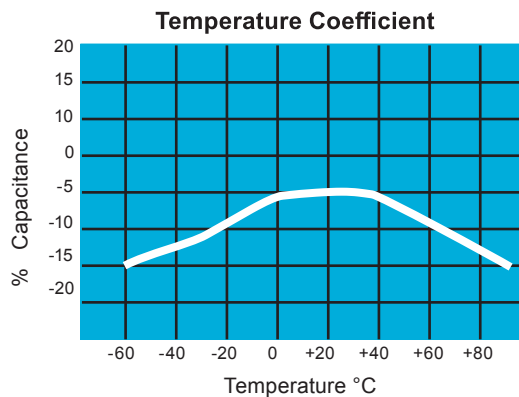
NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.  
Contact factory for non-specified capacitance values.



### PACKAGING CODES

| Code | EIA (inch) | IEC(mm) | 7" Paper | 7" Embossed | 13" Paper | 13" Embossed |
|------|------------|---------|----------|-------------|-----------|--------------|
| 02   | 01005      | 0402    | H        | P           | N         |              |
| 03   | 0201       | 0603    | H        |             | N         |              |
| 05   | 0402       | 1005    | H        |             | N         |              |
| 15   | 0603       | 1608    | T        |             | M         |              |
| 21   | 0805       | 2012    |          | U           |           | L            |
| 31   | 1206       | 3216    |          | U           |           | L            |
| 32   | 1210       | 3225    |          | U           |           | L            |
| 43   | 1812       | 4532    |          | V           |           | S            |

### TYPICAL ELECTRICAL CHARACTERISTICS



# X5R Dielectric, KGM Series

## Specifications and Test Methods



| X5R Specification Limits                   |  | X5R Specification Limits  | Measuring Conditions (Complies with JIS C5101 / IEC60384)  |           |             |      |   |             |           |   |              |           |
|--|--|---|--|-----------|-------------|------|---|-------------|-----------|---|--------------|-----------|
| Operating Temperature Range                |  | -55°C to +85°C  | Temperature Cycle Chamber  |           |             |      |   |             |           |   |              |           |
| Capacitance                                |  | Within specified tolerance  | Measure after heat treatment<br>Capacitance Frequency Volt<br>C≤10μF<br>Frequency : 1KHz±10%<br>Volt : 1.0±0.2Vrms *0.5±0.2Vrms<br>* :KGM02AR50J104, KGM02AR50J474,<br>KGM03CR50J225, KGM03BR50J225<br>KGM03DR50J475, KGM03CR50G475,<br>KGM05CR50J106<br><br>C>10μF<br>Frequency : 120Hz±10%<br>Volt : 0.5±0.2Vrms<br><br>The charge and discharge current of the capacitor must not exceed 50mA.  |           |             |      |   |             |           |   |              |           |
| Dissipation Factor / Tanδ                  |  | Refer to <a href="https://spicat.kyocera-avx.com">https://spicat.kyocera-avx.com</a> for individual part number specification       |  |           |             |      |   |             |           |   |              |           |
| Insulation Resistance                      |  | Refer to <a href="https://spicat.kyocera-avx.com">https://spicat.kyocera-avx.com</a> for individual part number specification       | Apply the rated voltage for 1 minute, and measure it in normal temperature and humidity.<br>The charge and discharge current of the capacitor must not exceed 50mA.  |           |             |      |   |             |           |   |              |           |
| Dielectric Strength                        |  | No breakdown or visual defects  | Charge device with 250% of rated voltage for 1-5 seconds, w/ charge and discharge current limited to 50 mA (max)<br>* KGM31AR52A225: 200% of rated voltage   |           |             |      |   |             |           |   |              |           |
| Bending Strength                           |  | No significant damage with 1mm bending  | Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.  |           |             |      |   |             |           |   |              |           |
| Solderability                              |  | Solder coverage : 95% min.  | Soaking condition<br>Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.   |           |             |      |   |             |           |   |              |           |
| Resistance to Solder Heat                  | Appearance                                 | No problem observed   | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Capacitance Variation                      | ± 7.5%  | Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in normal temperature and humidity, and measure after heat treatment.<br>(Pre-heating conditions)<br><table border="1"> <thead> <tr> <th>Order</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80 to 100°C</td> <td>2 minutes</td> </tr> <tr> <td>2</td> <td>150 to 200°C</td> <td>2 minutes</td> </tr> </tbody> </table><br>The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. | Order     | Temperature | Time | 1 | 80 to 100°C | 2 minutes | 2 | 150 to 200°C | 2 minutes |
|  | Order                                      | Temperature   |  | Time      |             |      |   |             |           |   |              |           |
|  | 1  | 80 to 100°C   |  | 2 minutes |             |      |   |             |           |   |              |           |
|  | 2  | 150 to 200°C  |  | 2 minutes |             |      |   |             |           |   |              |           |
| Dissipation Factor / Tanδ                  | Within specification                       |   |  |           |             |      |   |             |           |   |              |           |
| Insulation Resistance                      | Within specification                       |   |  |           |             |      |   |             |           |   |              |           |
| Withstanding Voltage / Dielectric Strength | Resist without problem                     |   |  |           |             |      |   |             |           |   |              |           |
| Thermal Shock                              | Appearance                                 | No visual defects   | Take the initial value after heat treatment.<br>(Cycle)<br>Room temperature (3 min.) →<br>Lowest operation temperature (30 min.) →<br>Room temperature (3 min.) →<br>Highest operation temperature (30 min.)<br>After 5 cycles, measure after heat treatment.  |           |             |      |   |             |           |   |              |           |
|  | Capacitance Variation                      | ± 7.5%  | The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.  |           |             |      |   |             |           |   |              |           |
|  | Dissipation Factor                         | Within specification  | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Insulation Resistance                      | Within specification  | After applying *1.5 the rated voltage at the highest operation temperature for 1000+12/ -0 hours, and measure the sample after heat treatment in normal temperature and humidity.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.<br>*Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.   |           |             |      |   |             |           |   |              |           |
|  | Withstanding Voltage / Dielectric Strength | Resist without problem  | Take the initial value after heat treatment.<br>After applying rated voltage for 500+12/ -0 hours in the condition of 40°C±2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.  |           |             |      |   |             |           |   |              |           |
| Load Life                                  | Appearance                                 | No visual defects   | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Capacitance Variation                      | ± 12.5%   | After applying *1.5 the rated voltage at the highest operation temperature for 1000+12/ -0 hours, and measure the sample after heat treatment in normal temperature and humidity.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.<br>*Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.   |           |             |      |   |             |           |   |              |           |
|  | Dissipation Factor / Tanδ                  | ≤ Initial Value x 2.0 (See Above)   | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Insulation Resistance                      | Over 1000MΩ or 50MΩ·μF, whichever is less. *Exceptions Listed Below   | After applying rated voltage for 500+12/ -0 hours in the condition of 40°C±2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.  |           |             |      |   |             |           |   |              |           |
| Load Humidity                              | Appearance                                 | No visual defects   | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Capacitance Variation                      | ± 12.5%   | After applying rated voltage for 500+12/ -0 hours in the condition of 40°C±2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.  |           |             |      |   |             |           |   |              |           |
|  | Dissipation Factor / Tanδ                  | Within specification  | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Insulation Resistance                      | Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below   | After applying rated voltage for 500+12/ -0 hours in the condition of 40°C±2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.<br>The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.  |           |             |      |   |             |           |   |              |           |
| Appearance                                 |  | No problem observed   | Microscope   |           |             |      |   |             |           |   |              |           |
| Termination Strength                       |  | No problem observed   | Apply a sideward force of 500g (5N) to a PCB-mounted sample. note : 2N for 0201 size, and 1N for 01005 size.   |           |             |      |   |             |           |   |              |           |
| Vibration                                  | Appearance                                 | No problem observed   | Take the initial value after heat treatment.   |           |             |      |   |             |           |   |              |           |
|  | Capacitance                                | Within tolerance  | Vibration frequency: 10 to 55 (Hz)<br>Amplitude: 1.5mm<br>Sweeping condition: 10 → 5 → 10Hz/ 1 minute in X, Y and Z directions: 2 hours each, 6 hours in total, and place in normal temperature and humidity, then measure the sample after heat treatment.  |           |             |      |   |             |           |   |              |           |
|  | Tanδ                                       | Within tolerance  |  |           |             |      |   |             |           |   |              |           |
| Heat treatment                             |  | Expose sample in the temperature of 150+0/ -10°C for 1 hour and leave the sample in normal temperature and humidity for 24±2 hours. |  |           |             |      |   |             |           |   |              |           |

Voltage to be applied in the High Temperature Load (Applied voltage is the multiple of the rated voltage)

| Rated Voltage | Products   |
|---------------|--|
| ×1.0          | 6.3V KGM02AR50J224, KGM02AR50J474, KGM03BR50J225, KGM03CR50J225, KGM03DR50J475, KGM05CR50J106, KGM05BR50J156, KGM05DR50J226, KGM21AR50J476 |
|               | 10V KGM02AR51A104, KGM03CR51A225, KGM15CR51A226  |
|               | 16V KGM03CR51C105, KGM05AR51C225, KGM05CR51C475, KGM15CR51C226   |
|               | 25V KGM05AR51E105, KGM05AR51E225, KGM05CR51E225, KGM05CR51E475, KGM15CR51E475, KGM15CR51E106, KGM21AR51E226                                |
|               | 35V KGM05AR51V105, KGM15CR51V475, KGM15CR51V106  |
|               | 100V KGM31AR52A225   |
| ×1.2          | 6.3V KGM03BR50J105   |
| ×1.3          | 6.3V KGM02AR50J153-104, KGM03AR50J474  |
|               | 10V KGM03AR51A223-224, KGM05AR51A105-225   |
|               | 16V KGM05AR51C105  |

<Load Life / Load Humidity>Insulation Resistance : Over 10MΩ · μF

| X5R / R5 | Products                                    |
|----------|---|
| 03       | KGM03BR51A105, KGM03CR51C224, KGM03CR51E224 |
| 05       | KGM05BR51A475, KGM05CR51A106, KGM05CR51V225 |



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# X5R Dielectric, KGM Series

## Capacitance Range



### PREFERRED SIZES ARE SHADED

| Case Size    | 1206         |                 |     |    |    |    |    |    | 1210            |      |     |    |    |    |    |    | 1812            |      |    |    |    |    |    |  |  |
|--------------|--------------|-----------------|-----|----|----|----|----|----|-----------------|------|-----|----|----|----|----|----|-----------------|------|----|----|----|----|----|--|--|
| Soldering    | Reflow/Wave  |                 |     |    |    |    |    |    | Reflow Only     |      |     |    |    |    |    |    | Reflow Only     |      |    |    |    |    |    |  |  |
| Packaging    | All Embossed |                 |     |    |    |    |    |    | All Embossed    |      |     |    |    |    |    |    | All Embossed    |      |    |    |    |    |    |  |  |
| (L) Length   | mm           | 3.20 ± 0.40     |     |    |    |    |    |    | 3.20 ± 0.40     |      |     |    |    |    |    |    | 4.50 ± 0.30     |      |    |    |    |    |    |  |  |
| (in.)        | (in.)        | (0.126 ± 0.016) |     |    |    |    |    |    | (0.126 ± 0.016) |      |     |    |    |    |    |    | (0.177 ± 0.012) |      |    |    |    |    |    |  |  |
| W) Width     | mm           | 1.60 ± 0.30     |     |    |    |    |    |    | 2.50 ± 0.30     |      |     |    |    |    |    |    | 3.20 ± 0.20     |      |    |    |    |    |    |  |  |
| (in.)        | (in.)        | (0.063 ± 0.012) |     |    |    |    |    |    | (0.098 ± 0.012) |      |     |    |    |    |    |    | (0.126 ± 0.008) |      |    |    |    |    |    |  |  |
| (t) Terminal | mm           | 0.50 ± 0.25     |     |    |    |    |    |    | 0.50 ± 0.25     |      |     |    |    |    |    |    | 0.61 ± 0.36     |      |    |    |    |    |    |  |  |
| (in.)        | (in.)        | (0.020 ± 0.010) |     |    |    |    |    |    | (0.020 ± 0.010) |      |     |    |    |    |    |    | (0.024 ± 0.014) |      |    |    |    |    |    |  |  |
| Voltage:     |              | 4               | 6.3 | 10 | 16 | 25 | 35 | 50 | 100             | 4    | 6.3 | 10 | 16 | 25 | 35 | 50 | 4               | 6.3  | 10 | 16 | 25 | 35 | 50 |  |  |
| Cap 100      | 101          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| (pF)150      | 151          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 220          | 221          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 330          | 331          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 470          | 471          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 680          | 681          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 1000         | 102          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 1500         | 152          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 2200         | 222          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 3300         | 332          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 3900         | 392          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 4700         | 472          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 5600         | 562          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 6800         | 682          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| Cap 0.010    | 103          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| (µF) 0.012   | 123          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.015        | 153          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.018        | 183          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.022        | 223          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.027        | 273          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.033        | 333          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.039        | 393          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.047        | 473          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.068        | 683          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.082        | 823          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.10         | 104          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.12         | 124          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.15         | 154          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.22         | 224          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.33         | 334          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 0.47         | 474          | M               | M   | M  | M  | M  | M  | M  |                 |      |     |    |    |    | C  | C  |                 |      |    |    |    |    |    |  |  |
| 0.68         | 684          |                 |     |    |    |    |    |    |                 |      |     |    |    |    |    |    |                 |      |    |    |    |    |    |  |  |
| 1            | 105          | H               | H   | H  | H  | H  | H  | H  |                 | E    | E   | E  | E  | E  | E  | E  |                 |      |    |    |    |    |    |  |  |
| 2.2          | 225          | H               | H   | H  | H  | H  | H  | H  | A               | L    | L   | L  | L  | L  | L  | L  |                 |      |    |    |    |    |    |  |  |
| 4.7          | 475          | H               | H   | H  | H  | A  | H  | A  |                 | J    | J   | J  | J  | J  | A  | A  |                 |      |    |    |    |    |    |  |  |
| 10           | 106          | H               | H   | H  | H  | A  | H  | H  |                 | J    | J   | J  | J  | J  | A  | A  |                 |      |    |    | J  |    |    |  |  |
| 22           | 226          | H               | H   | H  | A  | H  |    |    |                 | A    | A   | A  | L  | A  |    |    |                 | J    | J  | J  |    |    |    |  |  |
| 47           | 476          | H               | H   | H  | H  |    |    |    |                 | L    | L   | L  | L  | L  |    |    |                 |      |    |    |    |    |    |  |  |
| 100          | 107          | H               | H   |    |    |    |    |    |                 |      |     |    | L  |    |    |    |                 |      |    |    |    |    |    |  |  |
| Voltage:     |              | 4               | 6.3 | 10 | 16 | 25 | 35 | 50 | 100             | 4    | 6.3 | 10 | 16 | 25 | 35 | 50 | 4               | 6.3  | 10 | 16 | 25 | 35 | 50 |  |  |
| Case Size    |              | 1206            |     |    |    |    |    |    |                 | 1210 |     |    |    |    |    |    |                 | 1812 |    |    |    |    |    |  |  |

| Case Size              | 1206 (KGM 31) |     |     |      | 1210 (KGM 32) |      |     |      |      | 1812 (KGM 43) |
|------------------------|---------------|-----|-----|------|---------------|------|-----|------|------|---------------|
| Thickness Letter       | M             | A   | H   | C    | E             | J    | A   | L    | J    |               |
| Max Thickness (mm)     | 1.25          | 1.8 | 1.9 | 1.27 | 1.45          | 2.21 | 2.7 | 2.80 | 2.80 |               |
| Carrier Tape           | EMB           | EMB | EMB | EMB  | EMB           | EMB  | EMB | EMB  | EMB  |               |
| Packaging Code 7"reel  | U             | U   | U   | U    | U             | U    | U   | U    | V    |               |
| Packaging Code 13"reel | L             | L   | L   | L    | L             | L    | L   | L    | S    |               |
| EMBOSSED (EMB)         |               |     |     |      |               |      |     |      |      |               |

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